

LHC Integration of a Crab Cavity (Summary & Update of a talk at BNL WS)

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Legend:

♥ : could / should (compatibility) be obtained/made by CERN,
(but no promises of delivery today)

✱ : in radiation shielded area

The Mont Blanc as seen from Meyrin
400 mm lens, © J.T.

Survey (single, temporary CC) : best location at IP4 (ex-ALEPH)

- beam line centers are separated by 42 cm: enough lateral space
- the space foreseen for the 200 MHz capture cavities (+) is still free
(but might get needed for increasing beam current, at least 1 year forewarning)
- the space reserved for the transverse damper reserve is still free
(but might get needed for increasing beam current, forewarning: fabrication time)
- the 400 MHz main RF is at IP4: RF infra-structure exists
(RF reference, cooling water, ...) (but no guarantee for simple hook-up)
- foreseen location for the transmitters for the capture cavities is less than 100m away from CC (RF loop gain ≥ 100) → place CC transmitter there (**radiation protected area**)

(+) staged

- Cryogenic liquids exist at IP4 with $T \leq 1.9\text{K}$ and 4.5K

BUT

- pressure rises to 20 bar when magnet quench -> safety system (♥ as for main RF)
- the 1.9K LHe is repressurized at 1 bar, not boiling -> not directly usable for sc. cavities
- LHe operational T (2 or 4.5K) still open
 - if 4.5 K: ‘steal’ at main RF / equivalent system apart (♥)
 - if 2 K: (small) cold compressor for CC/ tapping ??
- cryo supply to be settled with AT-CR (cut metal !) (♥ ♥ ♥)

most complex part of the set-up

Additional installations in the tunnel & LEP's klystron gallery

- 800 MHz transmitter at a few 10 kW (*, ♥)
 - RF group needs (for SPS) exactly such amplifiers → use spare
- HV supply (*, ♥) for transmitter (a few 10 kV for IOT or klystron)
 - main transformer on ground level / hook onto main RF supply ?
- cooling water for transmitter: main RF klystrons 'next door' ... (♥)
- cooling water (♥) HOM dump cooling (if KEK/Cornell HOM design)
- compressed air (♥) (open/close [RF shielded] beam valves (♥))
- 240 / 3x400 V supply (♥) for removable vacuum pumps (♥),....
- High voltage cable (♥) for ion sputter pump (♥), HV supply (*, ♥)
- connection (♥) to data bus (controls net-work (*)) and cryo-controls
- control electronic crates (*, {♥})

(*) in radiation shielded area

Requirements for cryo-module:

- stable support (with wheels ?) and solid anchor-points (shaft !)
- Exterior dimensions - including non-detachable parts (coupler(s), ..)
 - fit LHC transport zone: 'roll' CC module to its place
 - once CC placed: leave room for other LHC components to pass
- remote controlled transverse positioning of cavity and/or cryostat
- valve/JT¹ cold box on module ? (to be discussed with AT-CR)
- He rupture disk (♥) & self-closing (small) tap (♥)
- matching taps (♥) for cryogenic liquid/gas, 'warm' return gas
- LHe level gauge (♥), He pressure gauge (♥)
- dedicated T-sensors (♥) for cool-down, survey when 'warm idling'

¹ Joule-Thomson



**Thank you
for your
attention!**